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10CFR50.73

LR-N08- 0044

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington DC 20555-001

LER 272/2007-003
Salem Nuclear Generating Station Unit 1
Facility Operating License No. DPR-70
NRC Docket No. 50-272

SUBJECT: Salem Unit 1 Automatic Reactor Trip Due to The Failure of 12 Station Power Transformer Load Tap Changer

This Licensee Event Report, "Salem Unit 1 Automatic Reactor Trip Due to The Failure of 12 Station Power Transformer Load Tap Changer" is being submitted pursuant to the requirements of the Code of Federal Regulations 10CFR50.73(a)(2)(iv)(A).

The attached LER contains no commitments. Should you have any questions or comments regarding this submittal, please contact Mr. E. H. Villar at 856-339-5456.

Sincerely,

Robert Braun
Site Vice President - Salem

Attachments (1)

IE22

NRR

cc Mr. S. Collins, Administrator - Region I
U. S. Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, PA 19406

Mr. R. Ennis, Licensing Project Manager - Salem
U. S. Nuclear Regulatory Commission
Mail Stop 08B1
Washington, DC 20555-0001

USNRC Senior Resident Inspector - Salem (X24)

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NRC FORM 366 (9-2007) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 08/31/2010

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

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4. TITLE Salem Unit 1 Automatic Reactor Trip Due to The Failure of 12 Station Power Transformer Load Tap Changer

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
12	28	2007	2007	0 0 3	0	02	25	2008		DOCKET NUMBER

9. OPERATING MODE

1

10. POWER LEVEL

100%

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§: *(Check all that apply)*

- ☐ 20.2201(b)
- ☐ 20.2201(d)
- ☐ 20.2203(a)(1)
- ☐ 20.2203(a)(2)(i)
- ☐ 20.2203(a)(2)(ii)
- ☐ 20.2203(a)(2)(iii)
- ☐ 20.2203(a)(2)(iv)
- ☐ 20.2203(a)(2)(v)
- ☐ 20.2203(a)(2)(vi)
- ☐ 20.2203(a)(3)(i)
- ☐ 20.2203(a)(3)(ii)
- ☐ 20.2203(a)(4)
- ☐ 50.36(c)(1)(i)(A)
- ☐ 50.36(c)(1)(ii)(A)
- ☐ 50.36(c)(2)
- ☐ 50.46(a)(3)(ii)
- ☐ 50.73(a)(2)(i)(A)
- ☐ 50.73(a)(2)(i)(B)
- ☐ 50.73(a)(2)(i)(C)
- ☐ 50.73(a)(2)(ii)(A)
- ☐ 50.73(a)(2)(ii)(B)
- ☐ 50.73(a)(2)(iii)
- ☒ 50.73(a)(2)(iv)(A)
- ☐ 50.73(a)(2)(v)(A)
- ☐ 50.73(a)(2)(v)(B)
- ☐ 50.73(a)(2)(v)(C)
- ☐ 50.73(a)(2)(v)(D)
- ☐ 50.73(a)(2)(vii)
- ☐ 50.73(a)(2)(viii)(A)
- ☐ 50.73(a)(2)(viii)(B)
- ☐ 50.73(a)(2)(ix)(A)
- ☐ 50.73(a)(2)(x)
- ☐ 73.71(a)(4)
- ☐ 73.71(a)(5)
- ☐ OTHER

Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMBER (Include Area Code)
Enrique Villar	(856) 339 -5456

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
X	FK	XFMR	W120	Y					

14. SUPPLEMENTAL REPORT EXPECTED

☐ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)* ☒ NO

15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR

ABSTRACT *(Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)*

At 1754 on December 28, 2007, Salem Unit 1 experienced an automatic reactor trip due to low Reactor Coolant System loop flow when the 12 Station Power Transformer (SPT) failed.

The loss of the 12 SPT resulted in a loss of power to the 1 "F" and 1 "G" Group Busses and associated 13 and 14 Reactor Coolant Pumps causing a subsequent reactor trip on low Reactor Coolant System loop flow. Inadequate scope of maintenance procedures performed on 12 SPT Load Tap Changer (LTC) internal components and insufficient performance monitoring of degrading LTC conditions resulted in the failure of the collector rings and stationary and moving contacts on the LTC. There were no complications associated with the unit trip. The failed components were replaced, the transformer was tested satisfactorily and the unit was returned to service on December 31, 2007.

This report is being made in accordance with 10CFR50.73(a)(2)(iv)(A), "any event or condition that resulted in manual or automatic actuation of any of the systems listed in paragraph (a)(2)(iv)(B)...."

NARRATIVE

PLANT AND SYSTEM IDENTIFICATION

Westinghouse – Pressurized Water Reactor (PWR/4)

{FK/XFMR} Switchyard System / Transformer

* Energy Industry Identification System {EIIS} codes and component function identifier codes appear as {SS/CCC}

IDENTIFICATION OF OCCURRENCE

Event Date: December 28, 2007

Discovery Date: December 28, 2007

CONDITIONS PRIOR TO OCCURRENCE

Salem Unit 1 was in Operational Mode 1 at 100% of rated thermal power.

No structures, systems or components were inoperable at the time that contributed to the event.

DESCRIPTION OF OCCURRENCE

At 1754 on December 28, 2007, Salem Unit 1 experienced an automatic reactor trip due to low Reactor Coolant System (RCS) loop flow.

On July 5, 2007, the 1 "F" and 1 "G" Group Busses were transferred from their normal power supply (Auxiliary Power Transformer (APT) {FX/XFMR}) to their alternate power supply (12 Station Power Transformer (SPT)) due to high levels of combustible gasses in the Load Tap Changer (LTC) oil. On July 10 gas-sampling results for 12 SPT were received indicating elevated levels of ethylene, ethane and acetylene in the LTC. An Adverse Conditioning Monitoring (ACM) plan was established requiring daily gas analysis until stable results were obtained. Sampling frequency was reduced to weekly and monthly on July 17 and September 17, respectively based upon stable analysis results.

DESCRIPTION OF OCCURRENCE (cont'd)

On December 21 and 26, 2007, gas analysis results of 12 SPT LTC oil indicated a step increase in ethylene, and ethane gas concentrations and the ACM was revised to specify daily sampling of the 12 SPT LTC oil.

On December 28, 2007, thermography indicated a 2-foot by 2-foot hot spot on the lower section of the 12 SPT. The tap changer position was lowered two taps from +7 to +5 and loads were reduced in an attempt to reduce the temperature at the hot spot. Temperature was successfully reduced and stabilized; however, approximately one hour after this temperature decrease, overhead alarm K-19 "12 Station Power Transformer Trouble" was received in the Unit 1 Control Room due to indicated low oil level in the SPT. This alarm was received in conjunction with the 12 SPT output voltage oscillating from 3.7 to 4.1 kV. Attempts to manually adjust the voltage to control the oscillations were unsuccessful and the Shift Manager (senior licensed operator) directed transfer of the 1 "F" and 1 "G" loads to the APT. While preparing to transfer the loads, the 12 SPT tripped on transformer differential thereby de-energizing the 1 "F" and 1 "G" group busses. The loss of power to the 1 "F" and 1 "G" busses resulted in the loss of electrical power to the 13 and 14 Reactor Coolant Pumps (RCPs) and a reactor trip due to low of RCS flow.

All safety systems responded as required, and Unit 1 was stabilized in Mode 3 with decay heat being removed via the condenser steam dumps.

This report is being made in accordance with 10CFR50.73(a)(2)(iv)(A), "any event or condition that resulted in manual or automatic actuation of any of the systems listed in paragraph (a)(2)(iv)(B)...."

CAUSE OF OCCURRENCE

The root cause of the failure of 12 SPT LTC is inadequate scope of maintenance procedures performed on LTC internal components and insufficient performance monitoring of degrading LTC conditions.

While the Salem procedure was consistent with the industry standards for this type of transformer, it did not require any contact tension checks, contact minimum thickness requirements nor establish trending criterion for contact wear. The system performance monitoring established to monitor the operation of the SPT with the elevated gassing trended the rate of gassing of the transformer and the stabilization points in accordance with industry standards. However, it did not provide adequate action levels or criteria for removing the SPT from service.

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CAUSE OF OCCURRENCE (cont'd)

The trip of the 12 SPT resulted in the loss of power to the 1 "F" and 1 "G" group busses, causing 13 and 14 RCPs to de-energize, and the subsequent reactor trip due to low RCS flow.

PREVIOUS OCCURRENCES

A review of LERs at Salem Station dating back to 2005 did not identify any similar occurrences, where a reactor trip was generated due to LTC failures.

SAFETY CONSEQUENCES AND IMPLICATIONS

There was no actual safety consequence associated with this event.

Offsite power was never lost to the safety related busses as a result of the station power transformer failure and all safety systems responded as expected. The operating crew took appropriate actions, in accordance with training requirements and expectations, in response to the alarms received and to stabilize the plant following the reactor trip.

A review of this event determined that a Safety System Functional Failure (SSFF) as defined in NEI 99-02, Regulatory Assessment Performance Indicator Guidelines, did not occur. There was no condition that alone could have prevented the fulfillment of a safety function of a system needed to remove residual heat.

CORRECTIVE ACTIONS

1. The failed selector switch, contacts and collector rings were replaced on 12 the SPT.

2. High voltage AC insulation testing (DobleTesting) of the 12 SPT was performed prior to Unit restart.

3. The transformer preventative maintenance procedures for LTCs will be revised to include contact tension checks, contact minimum thickness requirements and to establish trending criterion for contact wear. In addition, the procedure will be revised to include detailed documentation of the as found condition of LTC internal components.

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CORRECTIVE ACTIONS (cont'd)

4. The system performance-monitoring plan will be revised to include dissolved gas analysis criteria with action levels and plans for each LTC.

5. The Unit 1 APT LTC was cleaned and inspected.